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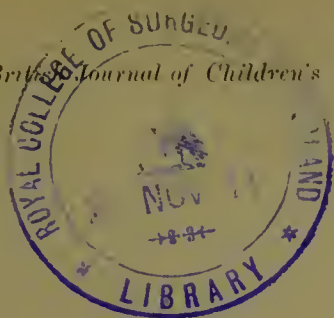
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## EPIDEMIC CEREBRO-SPINAL MENINGITIS IN PARIS— A REVIEW.

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THE recent epidemic of cerebro-spinal meningitis in Paris and the scattered outbreaks throughout the provinces, though they never assumed alarming proportions,\* have been of sufficient importance to rouse considerable interest in the French medical world, as is shown by the numerous publications relating thereto. The predilection of the disease for children, which has been attributed by Chanffard to the relatively free communication existing at that age between the nasal fossæ and the meninges, has been well exemplified in this as in other epidemics; and it is from physicians attached to the children's hospitals, and especially from Dr. Netter of the Hôpital Trousseau, that the most instructive communications have emanated. The value of anti-meningococcic serum, to which American physicians have recently testified, has been unanimously confirmed in this epidemic. Under the new treatment not only has the mortality—which under previous methods ranged from 60 to 80 per cent.—fallen to under 20 per cent., but recovery has been rapid, and sequelæ have been comparatively rare. The mortality, though still high in infancy, has been reduced from 87·5 per cent. to 33·3 per cent. in children under one year. In serum-treated cases the number of sequelæ was only 2·85 per cent., of which otitis interna was the most frequent and serious, as compared with 23·5 per cent. in cases not so treated (1). Numerous brands of serum were employed, but those which yielded the best results were prepared by Flexner at the Rockefeller Institute in New York and by Dopter at the Institut Pasteur in Paris. Dopter (2) has compiled statistics of 196 cases which have been treated with his serum in various parts of France since the beginning of 1909. The mortality was 15·86 per cent., which falls to 10·32 per cent. on subtracting the cases which

\* Netter calculates that about three hundred cases have occurred in Paris between January and May of the present year, 'Bull. de l'Acad. de Méd.,' tome 61, 1909, p. 508.

were moribund when first treated, as well as those in which death was due to other causes than meningitis. In three kinds of cases he admits that the serum is of no avail—cases treated too late, septicaemic, or hypertoxic forms, and cases in which cerebral symptoms predominate. He has found that the intra-venous injection into horses of living cultures of the meningococcus has produced a more efficacious serum than that furnished by simultaneous injection of both the micro-organisms and their toxins, since the mortality of cases treated with serum prepared by the former method was 10.93 per cent., as contrasted with a mortality of 18.18 per cent. among cases treated with serum prepared by the latter method.

Netter (3) treated fifty cases exclusively by Flexner's serum, with a mortality of 18 per cent., which falls to 8.89 per cent. on subtraction of the moribund cases and of those in whom death was due to other causes than meningitis (reduced mortality). The reduced mortality among the children under two years, who formed nearly a third of the total, was 15.4 per cent., and among the rest 5.8 per cent. The earlier the treatment is adopted the more likely it is to be successful; but that it may be of value even in late cases is shown by the fact that speedy recovery occurred in four of Netter's cases, which had first been injected on the sixteenth, twenty-fourth, twenty-fifth, and twenty-eighth days respectively (4). The method of administration is important. Subcutaneous injection is useless owing to the impermeability of the meninges, and should be abandoned. To be efficacious the serum should be injected into the spinal theca. In each case the injection should be preceded by lumbar puncture, and the amount of cerebro-spinal fluid withdrawn should equal or preferably exceed the amount of serum injected. Dopter (5) states that if this precaution be not taken signs of compression may result, as shown by severe headache, convulsions, and syncopal attacks. In some cases, however, in which repeated lumbar puncture may fail to remove any fluid, injection of serum is none the less urgent. It is, therefore, consoling to learn that both Netter (6) and Comby (7) have on several occasions injected serum after a "dry tap," with beneficial results. Netter (8) recommends the employment of comparatively large doses at a time—20 to 30 c.c. for children, and 30 to 45 c.c. for adults. According to the same authority the injection should be repeated daily for three to four days in every case, at the end of which time not only is there an improvement in the general condition, but the cerebro-spinal fluid is clearer, the meningococci diminish in size and number, and lose their staining capacity and

viability in cultures, while the leucocytes show less morbid change and tend to disappear. A high temperature by itself should not be regarded as an indication for fresh injections. Pyrexia and even temporary aggravation of the meningeal symptoms may be due to the serum, especially in cases of anaphylaxis (9). The possibility of such symptoms occurring is, of course, no contra-indication to the employment of anti-meningococcal serum any more than the possibility of anaphylaxis is to the administration of antitoxin in the treatment of diphtheria. The frequency and date of appearance of serum eruptions, usually of an urticarial type following intra-spinal injection, are just the same as with rashes following the subcutaneous method, as Netter (10) shows by comparing his figures with those given by Currie in the Glasgow epidemic. In addition to serotherapy, the frequent use of hot baths and the employment of collargol by injection, subcutaneous or intra-muscular injection have been found of service by Netter (11). The application of leeches to the mastoids and ice to the head, with ealomet and iodide of potassium internally, is recommended by Boinet (12). The administration of diphtheria antitoxin, advocated by some writers, is severely criticised by Netter, who has collected from literature all the cases so treated, among whom the mortality was over 80 per cent. (13). The experience furnished by the French epidemic has confirmed the prevailing doctrine that cerebro-spinal fever, though undoubtedly contagious, is much less so than the common eruptive fevers, including typhoid. The vitality of the meningococcus outside the human body is feeble, since it is soon destroyed by desiccation or mild disinfectants. In only twelve out of eighty-two cases investigated by Netter (14) was there a history of contagion. Everything tends to show that the disease is spread by healthy "carrier" cases. The prophylaxis of the disease therefore requires the isolation of carrier cases and the disinfection of their nasal cavities in which the meningococci lodge, for which purpose the insufflation of dried serum and spraying with pyocyanase are recommended. Carriers appear to be more frequent in the houses of the poor than in well-to-do families, and their rarity among the medical and nursing staffs of a well ventilated hospital is shown by the fact that Netter did not find a single case among the ten members of his staff. It is interesting to learn that the number of carriers who subsequently develop the disease is small. Thus Vaillard (15) states that among seventy-four carriers examined and isolated during an epidemic at Evreux only one case subsequently was attacked with meningitis, eleven days after he was isolated.



Several interesting papers have appeared on the changes of the cerebro-spinal fluid in the course of the disease. As is well known, the typical fluid of cerebro-spinal meningitis is turbid and its cellular contents consist almost exclusively of polymorphonuclear leucocytes. Netter and Debré (16), however, have shown that clear fluid, the cell contents of which are mainly mononuclears, may be met with both at the beginning and in the late stage of the disease. Similar evidence is given by Dopter (17), who in four out of 145 specimens of cerebro-spinal fluid from cases of epidemic cerebro-spinal meningitis found an abundant or even exclusive lymphocytosis, and by Boinet (18), who describes a malignant form of rapid evolution in which the cerebro-spinal fluid is clear and rich in lymphocytes. It can readily be understood that such cases may be regarded as tuberculous meningitis, especially if no meningococci can be found in the fluid, and serum treatment be withheld to the detriment of the patient. For the recognition of the true nature of such cases Vincent (19) has introduced a method which he has denominated the precipito-reaction. The cerebro-spinal fluid of the suspected case is centrifugalised, and the clear supernatant fluid is poured into three tubes. To each of the first two a drop of anti-meningococcic serum is added, while the third tube serves as a control. The tubes are then hermetically sealed and placed in an incubator at 55° C. After eight hours, if the reaction is positive, a turbidity will be found in the first two tubes, owing to the precipitation of the soluble products of the meningococcus by the specific serum. Other observers (20) have confirmed the value of this reaction, which is of service for detecting not only cases of cerebro-spinal meningitis in an early stage but also those which run an abortive course throughout (21) as well as the fulminating cases already alluded to, described by Boinet. Associated forms of cerebro-spinal meningitis in which there is a simultaneous infection of the meninges by the tubercle bacillus and the meningococcus are stated by R. Debré (22), Netter's interne, to occur with special frequency in epidemic times. The existence of such forms, as Debré points out, can only be determined by bacteriological examination of the cerebro-spinal fluid.

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